Claims

1. Hydraulic control and adjustment system for a lifting mechanism (100) of a working tool (6) in a mobile machine with at least a first and second lifting cylinder (61, 62), in which cylinder pistons (63, 65) are displaceable, the position or direction of movement of which in the lifting cylinders (61, 62) fix the lifting height or the vertical direction of movement of the working tool (6) relative to a vehicle body (4) of the mobile machine, wherein each of the cylinder pistons (63, 65) divides the associated lifting cylinder (61, 62) into two adjusting pressure chambers (67 and 68, 69 and 70) in each case and with a second hydraulic pump (75), adjustable in respect of the discharge volume, the first connection (74) of which is connected depending on the vertical direction of movement of the working tool (6) to one of the adjusting pressure chambers (67) of the first lifting cylinder (61) and one of the adjusting pressure chambers (69) of the second lifting cylinder (62), **characterised in that**
the second connection (77) of the adjustable second hydraulic pump (75) is connected in a closed circuit to the other adjusting pressure chamber (68) of the first lifting cylinder (61) and the other adjusting pressure chamber (70) of the second lifting cylinder (62).

2. Hydraulic control and adjustment system for a lifting mechanism according to claim 1,
characterised in that

in each case a first adjusting pressure chamber (68; 69) borders on the associated cylinder piston (63; 65) with a pressurisation face (A1) which is smaller than the pressurisation face (A2) with which the other second adjusting pressure chamber (67; 70) in each case borders on the corresponding cylinder piston (63; 65) and in that each connection (74; 77) of the hydraulic pump (75) is connected to a first adjusting pressure chamber (68; 69) with a smaller pressurisation face (A1) and a second adjusting pressure chamber (70; 67) with a larger pressurisation face (A2).

3. Hydraulic control and adjustment system for a lifting mechanism according to claim 1 or 2,
characterised in that
a piston side adjusting pressure chambers (67) of the first lifting cylinder (61) is connected via a first hydraulic line (71) to a piston side adjusting pressure chamber (69) of the second lifting cylinder (62) and a piston side adjusting pressure chamber (68) of the first lifting cylinder (61) via a second hydraulic line (72) to a piston side adjusting pressure chamber (70) of the second lifting cylinder (62).

4. Hydraulic control and adjustment system for a lifting mechanism according to claims 1 or 2,
characterised in that
the two boom side adjusting pressure chambers (144, 146) of the first and second lifting cylinders (61, 62) are connected via a first hydraulic line (151) and the two vehicle body side adjusting

pressure chambers (145, 147) of the first and second lifting cylinders (61, 62) via a second hydraulic line (152).

5. Hydraulic control and adjustment system for a lifting mechanism according to claims 3 or 4,
characterised in that
the first lifting cylinder (61) and the adjusting piston (65, 143) of the second lifting cylinder (62) are connected to a boom (64) connecting the working tool (6) to the vehicle body (4) of the mobile machine and the second lifting cylinder (62) and the adjusting piston (63, 142) of the first lifting cylinder (61) are connected to the vehicle body (4) of the mobile machine.

6. Hydraulic control and adjustment system for a tilting mechanism (200) of a loading shovel (6) serving as a working tool (6) in a mobile machine with at least a first and second shovelling cylinder (1, 2), in which cylinder pistons (3, 5) are displaceable, the position or direction of movement of which in the shovelling cylinders (1, 2) fix the tilting angle or the tilting direction of the loading shovel (6) relative to a vehicle body (4), wherein each of the cylinder pistons (3, 5) divides the associated shovelling cylinder (1, 2) into two adjusting pressure chambers (7 and 8, 9 and 10) in each case, and with a first hydraulic pump (15), adjustable in respect of the discharge volume, the first connection (14) of which is connected depending on the tilting direction of the loading shovel (6) to one of the adjusting pressure chambers (7) of the first shovelling cylinder (1) and

one of the adjusting pressure chambers (10) of the second shovelling cylinder (2)
characterised in that
the second connection (17) of the adjustable first hydraulic pump (15) is connected in a closed circuit to the other adjusting pressure chamber (8) of the first shovelling cylinder (1) and the other adjusting pressure chamber (9) of the second shovelling cylinder (2).

7. Hydraulic control and adjustment system for a lifting mechanism according to claim 1,
characterised in that
in each case a first adjusting pressure chamber (8; 10) borders on the associated cylinder piston (3; 5) with a pressurisation face (A1) which is smaller than the pressurisation face (A2) with which the other second adjusting pressure chamber (7; 9) in each case borders on the corresponding cylinder piston (3; 5) and in that each connection (14; 17) of the hydraulic pump (15) is connected to a first adjusting pressure chamber (10; 8) with a smaller pressurisation face (A1) and a second adjusting pressure chamber (9; 7) with a larger pressurisation face (A2).

8. Hydraulic control and adjustment system for a tilting mechanism according to claim 6 or 7, **characterised in that**
the piston side adjusting pressure chamber (7) of the first shovelling cylinder (1) is connected via a first hydraulic line (11) to the piston side adjusting pressure chamber (10) of the second shovelling cylinder (2) and the piston side adjusting pressure

chamber (8) of the first shovelling cylinder (1) via a second hydraulic line (12) to the piston side adjusting pressure chamber (9) of the second shovelling cylinder (2).

9. Hydraulic control and adjustment system for a tilting mechanism according to claim 6 or 7,
characterised in that
the two loading shovel side adjusting pressure chambers (132, 134) of the first and second shovelling cylinders (1, 2) are connected via a first hydraulic line (136) and the two vehicle body side adjusting pressure chambers (133, 135) of the first and second shovelling cylinders (1, 2) via a second hydraulic line (137).

10. Hydraulic control and adjustment system for a tilting mechanism according to claim 8 or 9,
characterised in that
the first shovelling cylinder (1) and the adjusting piston (5, 131) of the second shovelling cylinder (2) are connected to the loading shovel (6) and the second shovelling cylinder (2) and the adjusting piston (3, 130) of the first shovelling cylinder (1) to the vehicle body (4) of the mobile machine.

11. Hydraulic control and adjustment system according to claim 1 and 6,
characterised in that
the discharge direction of the second hydraulic pump (75) operating in two-quadrant operation fixes the vertical direction of movement of the working tool (6) or the discharge direction of the first

hydraulic pump (15), likewise operating in two-quadrant operation, fixes the tilting direction of the loading shovel (6).

12. Hydraulic control and adjustment system according to claim 1 and 6,
characterised in that
the discharge volume discharged at the first and second connections (74, 77) of the second hydraulic pump (75) fixes the lifting height of the working tool (6) or the discharge volume discharged at the first and second connection (14, 17) of the first hydraulic pump (15) fixes the tilting angle of the loading shovel (6).

13. Hydraulic control and adjustment system according to claim 12,
characterised in that
the adjustment of the discharge direction of the first hydraulic pump (15) and the discharge volume discharged at the first and second connections (14, 17) of the first hydraulic pump (15) is done as a function of a deflection set on a steering instrument (52) constructed in the manner of a joystick in a first deflection dimension and the setting of the direction of rotation of the second hydraulic pump (75) and the adjusting pressure built up at the first and second connections (74, 77) of the second hydraulic pump (75) is done as a function of a deflection set on the steering instrument (52) constructed in the manner of a joystick in a second deflection dimension.

14. Hydraulic control and adjustment system according to claim 13,
characterised in that
a first adjusting valve (41) is actuated as a function of the deflection of the steering instrument (52) in the first deflection dimension and a second adjusting valve (102) is actuated as a function of the deflection of the steering instrument (52) in the second deflection dimension.

15. Hydraulic control and adjustment system according to claim 14,
characterised in that
the deflection of the first adjusting valve (41) is done by electric adjusting magnets on control connections (49, 50) of the first adjusting valve (41), wherein one control connection (49) receives a first electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the first deflection dimension, corresponding to the tilting inwards movement, and the other control connection (50) receives a second electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the first deflection dimension, corresponding to the tilting outwards movement, from a transformer of the steering instrument (52) and in that the deflection of the second adjusting valve (102) is done by electric adjusting magnets at control connections (110, 111) of the second adjusting valve (102), wherein one control connection (110) receives a third electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the second

deflection dimension, corresponding to the lifting movement, and the other control connection (111) receives a fourth electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the second deflection dimension, corresponding to the lowering movement, from a transformer of the steering instrument (52).

16. Hydraulic control and adjustment system according to claim 14,
characterised in that
the deflection of the first adjusting valve (41) is done by adjusting pressures generated by a pilot control device (130) from the deflection of the steering instrument (52) in the first deflection dimension and supplied to control chambers located at the two control connections (49, 50) of the first adjusting valve (42) and the deflection of the second adjusting valve (102) is done by adjusting pressures generated by the pilot control device (130) from the deflection of the steering instrument (52) in the second deflection dimension and supplied to control chambers located at the two control connections (110, 111) of the second adjusting valve (102).

17. Hydraulic control and adjustment system according to claim 16,
characterised in that
the pilot control device (130) via a first pair of pressure reducing valves (143) consisting of two pressure reducing valves (139, 140), the inputs of which are connected in each case to a high pressure side connection (24) of a first feed pump (19), and a

hydraulic tank (138) which generates adjusting pressures corresponding to the deflection of the steering instrument (52) in the two directions of the first deflection dimension for actuating the first adjusting valve (42) and via a second pair of pressure reducing valves (144), consisting of two pressure reducing valves (141, 142), the inputs of which are connected in each case to a high pressure side connection (24) of a first feed pump (19) and a first hydraulic tank (138) which generates adjusting pressures corresponding to the deflection of the steering instrument (52) in the two directions of the second deflection dimension for the second adjusting valve (102).

18. Hydraulic control and adjustment system according to one of claims 14 to 17,
characterised in that
the first and second adjusting valve (41, 102) is in each case a 4/3 port directional control valve, wherein the first input connection (44, 105) of the first adjusting valve (41) is connected to the high pressure side connection (24) of the first feed pump (19), the first input connection (105) of the second adjusting valve (102) is connected to a high pressure side connection (84) of a second feed pump (79), the second input connection (46, 107) of the first and second adjusting valves (41, 102) is connected in each case to a hydraulic tank (48, 109), the first output connection (40) of the first adjusting valve (41) is connected to a first adjusting pressure chamber (37) of a first adjusting device (35), the first output connection (101) of the

second adjusting valve (102) is connected to a first adjusting pressure chamber (97) of a second adjusting device (95), the second output connection (43) of the first adjusting valve (41) is connected to a second adjusting pressure chamber (38) of a first adjusting device (35) and the second output connection (104) of the second adjusting valve (102) is connected to a second adjusting pressure chamber (98) of a second adjusting device (95).

19. Hydraulic control and adjustment system according to claim 18,
characterised in that
adjustment of the first hydraulic pump (15) in respect of the discharge direction and the discharge volume discharged at the first and second connection (14, 17) is done by the first adjusting device (35) and adjustment of the second hydraulic pump (75) in respect of the discharge direction and the discharge volume discharged at the first and second connections (74, 77) by the second adjusting device (95).

20. Hydraulic control and adjustment system according to one of claims 17 to 19,
characterised in that
the first hydraulic pump (15) and the first feed pump (19) or the second hydraulic pump (75) and the second feed pump (79) are driven by a common shaft (18, 78) in each case of a common or in each case separate machine, in particular by a diesel aggregate.

21. Hydraulic control and adjustment system according to one of claims 17 to 20,

characterised in that

a low pressure side connection (20) of the first feed pump (19) is connected via a filter (22) to a hydraulic tank (23), a low pressure side connection (80) of the second feed pump (79) via a filter (82) to a hydraulic tank (83), the high pressure side connection (24) of the first feed pump (19) via a check valve (29, 30) in each case to a first hydraulic load line (13) attached to a first connection (14) of the first hydraulic pump (15) and to a second hydraulic load line (16) attached to a second connection (17) of the first hydraulic pump (15) and the high pressure side connection (84) of the second feed pump (79) via a check valve (89, 90) in each case to a third hydraulic load line (73) attached to a first connection (74) of the second hydraulic pump (75) and to a fourth hydraulic load line (76) attached to a second connection (77) of the second hydraulic pump (75).

22. Hydraulic control and adjustment system according to claim 21,

characterised in that

a check valve (55, 116) with an opener (58, 129) is provided in the first and third hydraulic load lines (13, 73) in each case.

23. Hydraulic control and adjustment system according to claim 22,

characterised in that,

after transformation into a corresponding pressure, the second electric adjusting signal actuates an opener (58) of the check valve (55) integrated in the

first hydraulic load line (13) and, after transformation into a corresponding pressure, the fourth electric adjusting signal actuates an opener (129) of the check valve (116) integrated in the third hydraulic load line (73).

24. Hydraulic control and adjustment system according to claim 21,
characterised in that
the second adjusting pressure generated by the pilot control device (130) actuates an opener (58) of the check valve (55) integrated in the first hydraulic load line (13) and the fourth adjusting pressure generated by the pilot control device (130) actuates an opener (129) of the check valve (116) integrated in the third hydraulic load line (73).

25. Hydraulic control and adjustment system according to claim 21,
characterised in that
located between the third and fourth hydraulic load lines (73, 76) is a 2/2 port directional control valve (119) which opens in the operating state "floating position" of the boom (64) by applying an electric signal to an electric adjusting magnet located at the control input (121) of the 2/2 port directional control valve (119) or alternately by applying an adjusting pressure in a control chamber located at the control input (121) of the 2/2 port directional control valve (119).

26. Hydraulic control and adjustment system according to claim 21,

characterised in that

the third hydraulic load line (73) is connected via a hydraulic line (128) to a hydraulic control arrangement (125) to damp pitching oscillations of the working tool (6) while the mobile machine is travelling.

27. Hydraulic control and adjustment system according to claim 26,

characterised in that

an electric signal corresponding to the speed of the mobile machine is conducted from a tachogenerator (126) of the mobile machine to the input (127) of the hydraulic control arrangement (125) to damp pitching oscillations of the working tool (6) while the mobile machine is travelling.